

What is claimed is:

1. A mass flow controller, comprising:

a body portion having a first internal passage and at least second internal passage formed therein;

a flow control valve coupled to the body portion and in communication with the first and second internal passages;

at least one pressure transducer coupled to the body portion and in communication with at least one of the first internal passage and the second internal passage;

a nonlinear flow restrictor configured to produce a high compressible laminar flow therethrough coupled to the second internal passage;

a thermal sensor in communication with at least one of the first internal passage, the second internal passage, and the flow restrictor; and

an exhaust vessel in communication with the flow restrictor.

2. The device of claim 1 wherein the second internal passage is configured to flow a fluid at a pressure greater than a pressure at an output of the flow restrictor

3. The device of claim 1 wherein exhaust vessel is under vacuum.

5. The device of claim 1 wherein exhaust vessel is under near vacuum

6. The device of claim 1 wherein exhaust vessel is under pressure drop of about 0 psia to about 5 psia.

7. The device of claim 1 wherein the flow restrictor is manufactured from a compressed and sintered material.

8. The device of claim 1 wherein the restrictor is porous.

9. The device of claim 1 wherein the flow restrictor comprises a coiled capillary tube.

10. The device of claim 1 wherein the flow restrictor is positioned downstream of the flow control valve.

11. The device of claim 1 wherein the flow restrictor is configured to enable a pressure drop between a flow restrictor inlet and a flow restrictor outlet of a highly compressible laminar flow of at least 50 percent.
12. The device of claim 1 further comprising at least one pressure transducer in communication with an outlet of the flow restrictor.
13. A mass flow controller, comprising:
 - one or more pressure sensors;
 - an upstream valve;
 - a nonlinear restrictor positioned downstream of the valve and the pressure sensor and configured to have a more incremental pressure per unit of flow at an inlet of the restrictor at low flows.
14. The device of claim 13 wherein the restrictor comprises a laminar flow element configured to produce a highly compressible laminar flow therethrough.
15. The device of claim 13, wherein the restrictor is configured to provide a pressure drop between a restrictor inlet and a restrictor outlet of at least about 50% of the pressure at an inlet of the flow restrictor.
16. The device of claim 13 wherein the restrictor is comprises a elongated capillary body having a small hydraulic diameter.
17. The device of claim 13 wherein the restrictor comprises a sintered body.
18. The device of claim 13 wherein the restrictor comprises a porous body having pores fomred in parallel and series formed thereon.
19. The device of claim 13 wherein the restrictor is formed in a variety of configurations selected from the group consisting of capillary tubes, annular gaps, annular plates, parallel plates, grooved plates, stacked plates, coiled capillary bodies, and coiled sheets.